

THE Norwegian Fishery Promotion Society of Bergen has petitioned the Government for a grant of £15,000 for the development of the deep-sea fisheries of Norway.

THE Merchant Taylors Company have recently voted ten guineas to the Parkes Museum to aid in its work of practical teaching and demonstrating sanitary science.

THE additions to the Zoological Society's Gardens during the past week include a Bonnet Monkey (*Macacus sinicus* ♀), two Rhesus Monkeys (*Macacus rhesus* ♀ ♀) from India, an Alpine Marmot (*Arctomys marmotta* ♀), European, a Vulpine Phalanger (*Phalangista vulpina* ♂) from Australia, presented by Mr. H. Austin Clow, F.Z.S.; three Esquimaux Dogs (*Canis familiaris*) from Greenland, presented by Mr. W. T. Tournay, F.Z.S.; three Derbian Wallabys (*Halmaturus derbianus*) from Australia, presented by Lieut. C. M. Hepworth, R.N.R.; four Alpine Accentors (*Accentor alpinus*), European, presented by the Lord Lilford, F.Z.S.; a Cardinal Grosbeak (*Cardinalis virginianus*) from North America, presented by Mr. Ayerst; four Lion Marmosets (*Midas rosalia*), an Eyra (*Felis eyra*) from Brazil, four Parrot Finches (*Erythrura psittacea*) from New Caledonia, two Common Gulls (*Larus canus*), a Black-headed Gull (*Larus ridibundus*), British, purchased; four Cereopsis Geese (*Cereopsis nove-hollandiae*) bred in the Gardens.

OUR ASTRONOMICAL COLUMN.

MR. TEBBUTT'S OBSERVATORY, WINDSOR, NEW SOUTH WALES.—Mr. John Tebbutt, the well-known and enthusiastic amateur astronomer of New South Wales, has just published a little pamphlet giving a history and description of his private observatory, the work of which, he remarks with justifiable pride, "has proved of sufficient importance to admit of Windsor being placed in the list of observatories in the British and American *Nautical Almanacs*, the *Connaissance des Temps*, and the *Berliner Astronomisches Jahrbuch*." And this distinction has been well earned, for the lists here given of observations made, and of papers contributed to various scientific publications, show the history of the little observatory to have been a most honourable one. Mr. Tebbutt has made all the observations himself, and until 1881 performed all the reductions; latterly he has received occasional assistance in the computations from his son or friends near. His instrumental equipment was for many years of the most modest description: for seven years it consisted principally of a sextant, and a telescope of 1½ inches aperture. In 1861 a refractor of 3¼ inches aperture, and in 1864 a transit instrument of 2 inches, were added. In 1872, Mr. Tebbutt became the possessor of an equatorial of 4½ inches, which was his chief instrument until about a year and a half ago, when he bought a fine 8-inch equatorial by Grubb, once the property of the late Dr. Bone, of Castlemaine. The observations made have been principally of comets, for a number of which Mr. Tebbutt has also computed orbits, but daily meteorological observations have been kept up for twenty-five years, the results of which have been published in five parts, and transit observations have been taken regularly for time. Mr. Tebbutt has also done good service to science by his papers on astronomical subjects in various organs of the colonial press, for hitherto the private pursuit of astronomy has been greatly neglected in the Australian colonies, and he has almost stood alone as an amateur observer. It is to be hoped that this record of his labours and his success may call forth many imitators.

PULKOWA OBSERVATORY.—The Report of this Observatory for the year ending May 31, 1887, refers to the heavy loss the institution sustained in the death of Dr. August Wagner. Owing to his death, the work of publication has been somewhat delayed; he had, indeed, finished a memoir on personal and instrumental errors for the introduction of vol. xii., but the materials he left for the stellar and planetary catalogues were not so readily dealt with. Still, it is expected that this volume, and the introduction to vol. xiv., may soon be ready for publication; vols. xv. and xvi., which will contain meridian observations for the period 1872-80, and the catalogue, are ready to fol-

low vol. xiv. through the press. Of vol. viii., the catalogue, forming the first part—meridian observations 1840-69 of Bradley and other stars down to mag. 6—has already been distributed, and the remainder is in hand; vol. x., Prof. Struve's double-star observations, is still incomplete. The observational work of the Observatory has suffered no great change. The 30-inch refractor has been used by Dr. H. Struve for the measurement of the more difficult of Burnham's stars, the fainter satellites of Saturn, and the satellite of Neptune. The old 15-inch has been used by Drs. H. Struve and Hasselberg for photographic experiments, and by Prof. O. Struve for observations of Procyon, which has now been followed through nearly a complete period of its orbital motion.

WOLSEINGHAM OBSERVATORY.—The Rev. T. E. Espin reports that during the last year he has continued his sweeping for red stars and stars with remarkable spectra, and that he has published spectra of 126 objects in the *Astronomische Nachrichten*, Nos. 2788 and 2825, of which eighty-six were found in the sweeps. Fifteen of the stars were of Secchi's type IV. Three new variables of long period have been discovered, and the usual observations of variables have been made and forwarded to Prof. E. C. Pickering. The Observatory has been enriched by the present from Canon Slatter of a fine 4.8-inch equatorial by Troughton and Simms. The new edition of Birmingham's Red Star Catalogue will be ready for the printer in a few weeks.

ASTRONOMICAL PHENOMENA FOR THE WEEK 1888 FEBRUARY 26—MARCH 3.

(FOR the reckoning of time the civil day, commencing at Greenwich mean midnight, counting the hours on to 24, is here employed.)

At Greenwich on February 26

Sun rises, 6h. 54m.; souths, 12h. 13m. 10°.0s.; sets, 17h. 32m.; right asc. on meridian, 22h. 36'3m.; decl. 8° 48' S. Sidereal Time at Sunset, 3h. 56m. Moon (Full, February 27, 12h.) rises, 16h. 22m.; souths, 23h. 50m.; sets, 7h. 4m.*; right asc. on meridian, 10h. 15'3m.; decl. 12° 53' N.

Planet.	Rises.		Souths.		Sets.		Right asc. and declination on meridian.	
	h.	m.	h.	m.	h.	m.	h.	m.
Mercury..	6	53	12	50	18	47	23	13'3 ... 1 26 S.
Venus ...	5	39	9	58	14	17	20	20'4 ... 19 26 S.
Mars ...	22	15*	3	33	8	51	13	55'0 ... 8 58 S.
Jupiter ...	1	40	5	53	10	6	16	14'6 ... 20 17 S.
Saturn ...	13	50	21	47	5	44*	8	11'6 ... 20 35 N.
Uranus ...	21	8*	2	41	8	14	13	2'6 ... 5 56 S.
Neptune..	9	38	17	18	0	58*	3	42'0 ... 17 57 N.

* Indicates that the rising is that of the preceding evening and the setting that of the following morning.

Variable Stars.

Star.	R.A.		Decl.		h.	m.
	h.	m.	h.	m.		
U Cephei ...	0	52'4	81° 16' N.	...	Feb. 29,	18 56 <i>m</i>
Algol ...	3	0'9	40° 31' N.	...	Mar. 1,	3 12 <i>m</i>
λ Tauri...	3	54'5	12° 10' N.	...	...	3, 1 28 <i>m</i>
ζ Geminorum ...	6	57'5	20° 44' N.	...	Feb. 28,	22 0 <i>m</i>
R Canis Majoris...	7	14'5	16° 12' S.	...	...	29, 19 18 <i>m</i>
					Mar. 1,	22 34 <i>m</i>
U Monocerotis ...	7	25'5	9° 33' S.	...	Feb. 26,	...
δ Libræ ...	14	55'0	8° 4' S.	...	...	29, 1 32 <i>m</i>
R Ophiuchi...	17	1'3	15° 57' S.	...	...	28, <i>M</i>
U Ophiuchi...	17	10'9	1° 20' N.	...	Mar. 1,	0 42 <i>m</i>
					and at intervals of	20 8
X Sagittarii ...	17	40'5	27° 47' S.	...	Feb. 26,	2 0 <i>M</i>
W Sagittarii ...	17	57'9	29° 35' S.	...	Mar. 2,	5 0 <i>m</i>
R Lyræ ...	18	51'9	43° 48' N.	...	...	2, <i>M</i>
U Aquilæ ...	19	23'3	7° 16' S.	...	...	3, 5 0 <i>m</i>
S Aquilæ ...	20	6'5	15° 17' N.	...	Feb. 26,	...
Y Cygni ...	20	47'6	34° 14' N.	...	...	27, 19 24 <i>m</i>
					Mar. 1,	19 18 <i>m</i>
S Cephei ...	21	36'6	78° 7' N.	...	...	3, <i>M</i>
δ Cephei ...	22	25'0	57° 51' N.	...	...	1, 21 0 <i>M</i>

M signifies maximum; *m* minimum.

Occultation of Star by the Moon (visible at Greenwich).

Feb.	Star.	Mag.	Disap.	Reap.	Corresponding angles from ver- tex to right for inverted image.
26 ...	7 Leonis ...	6½ ...	h. m. 5 16 ...	h. m. 6 7 ...	112° 29'
March.	h.				
1 ...	23 ...	Mars in conjunction with and 2° 37' south of the Moon.			
3 ...	19 ...	Mercury in inferior conjunction with the Sun.			
<i>Meteor-Showers.</i>					
		R.A.	Decl.		
Near δ Virginis ...	192 ...	2° N. ...	March 2 and 3.		
From Sagittarius ...	280 ...	17 S. ...	Very swift; streaks.		

THE RELATIONS BETWEEN GEOLOGY AND THE BIOLOGICAL SCIENCES.¹

IN the remarks which at our last anniversary I had the honour of offering from this chair, I congratulated the students of geology and mineralogy upon the new and intimate relations which, to their mutual advantage, are now growing up between those departments of science. It has, however, been suggested that, while geologists are thus being brought into closer alliance with mineralogists, the strong bonds of union which have so long united us with the biologists are becoming somewhat relaxed, and, indeed, stand in no small danger of actual dissolution.

Highly as I estimate the value of the *rapprochement* between the geological and mineralogical sciences, I for one should regard such a result as far too dearly purchased, if it necessarily involved any interruption of the close relations which have so long subsisted between geology and biology. But I cannot for one moment believe that such a grievous misfortune seriously threatens the cultivators of the two great departments of natural science.

Notwithstanding certain divergencies of opinion which have made themselves heard within an ancient University, and have awakened a faint echo in the halls of our National Museum, I cannot doubt that the teachers of geology and biology will easily discover a *modus vivendi* upon what is, after all, a subject of very secondary importance—the arrangement of natural-history collections.

No one can read recent declarations of the present Director of our National Museum without being impressed by his manifest desire to make the splendid collections under his care reflect, as completely as possible, the present condition of our knowledge of natural history. And if, on the other hand, we turn to the remarks made by the Keeper of the Zoological Department, at Swansea, in 1880, and to those of the Keeper of the Palæontological Department, at Manchester, last year, we shall find in those utterances ample guarantees that, in the arrangement of their collections, questions of practical convenience will not be lost sight of; we shall be satisfied that there is not the smallest danger of revolutionary ideas leading to the removal of "ancient landmarks," or of unattainable ideals being sought through the wholesale commingling of incongruous elements. The collections of our Universities are happily free from the conditions which must always hamper an institution where the interests of popular amusement have to be reconciled with those of scientific work; and it is for the teachers of natural science in those centres of thought to agree upon an arrangement which may best serve to illustrate their courses of instruction.

But while the discussion on museum-arrangement may be regarded as a purely academical one, which, after scintillating for a while in letters and pamphlets, died out in some not very formidable explosions at the recent meeting of the British Association, it may be wise on our part not to pass by quite unnoticed some indications of the attitude of the younger school of biologists towards palæontological science, this attitude having been very conspicuously manifested during the discussion in question.

If I rightly apprehend the views of some of my biological friends, as gathered not only from their published utterances,

but also from private conversations, the position they are inclined to take up may be expressed somewhat as follows:—

"Palæontology has no right whatever to separate existence as a distinct branch of science. Fossils are simply portions of animals and plants, and ought to be dealt with as such; for all scientific purposes it is quite immaterial whether the organism which we are called upon to study expired only an hour since or died millions of years ago. Imperfect fragments can only be properly interpreted in the light afforded by the more complete structures found in recent organisms; and hence the naturalist who is engaged in studying a particular group of living organisms is the only person competent to deal with its fossil representatives. In our laboratories and our museums alike, therefore, fossil remains ought to be studied side by side with the living types which most nearly resemble them, and always by the same investigators. This being the case, it is neither necessary nor expedient that there should be a class of students whose chief concern is with extinct forms of life; and as for the geologists, they have really no farther concern with fossils than just to find them, attach a label indicating the period at which they must have lived, and hand them over to the biologist for study and incorporation in his collections. Any action beyond this can only be regarded, indeed, as an act of usurpation on the part of geologists, and must tend, not to the advancement, but to the injury of true science."

Such, so far as I have been able to gather them, are the extreme opinions which some biologists now entertain. It may, perhaps, seem presumptuous on my part to venture to offer a plea for palæontology, but there are considerations which may induce us to regard such a plea as coming better from one whose place in the ranks of the geological army lies nearer the centre than in the biological wing; from one who regards palæontology as the borderland of the geological and biological sciences—a borderland where the cultivators of both ought ever to meet, not for rivalry and aggression, but for the necessities of intellectual commerce and the advantages of mutual help.

The view of palæontology which I have ascribed, I believe not unjustly, to some biologists is one which has just such an amount of truth in it as to render it plausible, but at the same time, as I cannot but believe, is one of those half-truths which are proverbially more dangerous than downright errors. Palæontology is not, as has often been confidently asserted, simply a branch of biology; it is equally a part of geological science, and there are the strongest grounds, both of reason and expediency, for retaining it in that position. All geological science is based on the principle that the past can only be interpreted by the study of the present; Darwin was the intellectual child of Lyell, and the "Origin of Species" was the logical outcome of the "Principles of Geology." No palæontologist, worthy of the name, has ever dreamed of studying fossils except in the light afforded by the investigation of their recent analogues. Indeed, if we were to carry out the aggressive ideas of some biologists to their legitimate consequences, there would be left to us no science of geology at all; for why, it may be asked, should the study of physical processes in the past be carried on separately from the investigation of the same processes as exhibited at the present time? But then, by a strange Nemesis, I fear the same all-devouring physics, after swallowing up geology, would make very short work indeed with biology itself. And there is still in the background another claimant for universal empire in the realms of thought, for are there not some who dream of all sciences ultimately becoming the victims of that new portent of ambition—"geography"?

In considering the present position and future claims of palæontology, I may be permitted at the outset to offer a protest against a class of objections which has sometimes been very unfairly urged against the votaries of that branch of science. It has often been assumed that the students of fossils are contented with a lower standard of excellence than that which is aspired to by the cultivators of other branches of natural history. Now, setting aside for a moment the very important consideration that, owing to the imperfection of the remains which they are called upon to study, palæontologists are confronted by difficulties which do not beset the investigators of recent forms, I maintain that the charge is an altogether unjust one. Palæontologists are no more responsible for the unwise use made of fossils by incompetent persons than are zoologists for the vagaries of shell- and butterfly-hunters, or botanists for the absurdities of fern- and diatom-collectors.

Doubtless there has been much work done in connection with

¹ Address to the Geological Society by the President, Prof. John W. Judd, F.R.S., at the Anniversary Meeting, on February 17.